

STUDIES IN AUSTRALIAN THYSANURA.

No. 2—LEPISMATIDAE.

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The *Lepismatidae*, together with the *Machilidae*, form the suborder *Ectotrophi* of the *Thysanura*. As the subordinal name implies, their mouth-parts are not retracted within the head-capsule as in the *Entotrophi*, which comprises the *Campodeidae* and the *Japygidae*.

The family under discussion comprises those insects generally known as silver-fish. It is divided into three distinct subfamilies, *Lepismatidae*, *Nicoletinae* and *Maindroniinae*, the last of which does not occur in Australia. The first two subfamilies may be separated as follows:—

1. Subcoxae of genital segments broad and flat, covering bases of gonapophyses. Eyes present. Terminal segment of maxillary palpi without sensory papillae. Body always scaled.
Lepismatinae Esch., 1905
2. Subcoxae of genital segments narrow, not covering bases of gonapophyses. Eyes wanting. Terminal segment of maxillary palpi with conspicuous sensory papillae. Body scaled or unscaled.
Nicoletinae Esch., 1905

Both the above subfamilies differ from the *Maindroniinae* Esch., 1905, in that they have the inner edge of the maxillary lacinia furnished with teeth and bristles and not smooth.

Silver-fish are generally to be found under bark, or fallen logs or stones, and certain specialized forms are inhabitants of the nests of ants and termites. Other species are limited to houses and factories in which various kinds of comestibles are manufactured or stored. Of the eight genera and twenty species known to occur in Australia, three genera represented by five species are probably introductions by way of commerce from other parts of the world. The remaining five genera and fifteen species are truly indigenous, although all have representatives in other countries. The genus *Heterolepisma* occurs in South America, *Acrotelsella* in North and South America, *Atelura* in almost all regions but especially Africa and South America, *Atopatelura* in South Africa, and *Trinemura* in New Caledonia. The last genus is closely related to *Nicoletia* which occurs in many regions, and to *Trinemophora* which is known from South America.

The above distribution would seem to support the theory of the earlier connection of Australia, South Africa and South America *via* Antarctica.

Subfamily LEPISMATINAE Esch., 1905.

Five genera containing thirteen species and one variety are known from this country. Three of the genera and five species are extra-Australian and have probably been introduced by commerce.

The species are all long, narrow, fish-like insects with very long antennae and three long tails. They are heavily covered with scales and vary in colour from silvery-white to dark brown or almost black. In certain lights the darker forms often show remarkable reflections. The introduced forms may frequently be found in houses, factories and generally in warm places. These feed upon a variety of substances such as the starchy matter of wallpaper and book-bindings,

and on many household materials such as woollens and artificial silks. The native species are to be found under loose bark, stones and logs.

KEY TO THE AUSTRALIAN GENERA AND SPECIES OF LEPISMATINAE.

1. All dorsal and thoracic setae naked. 2
The larger dorsal and thoracic setae serrated, arranged in one or two pairs of brushes or combs. 6
2. The larger dorsal and thoracic setae single, never in brushes or combs. 3
Genus *Lepisma* L., 1758
saccharina L., 1758 (Cosmopolitan)
The setae of head and tergites arranged in brushes or combs. Rather flat species with tergite X very short and only slightly longer than IX; the inner pairs of dorsal setal brushes weak, consisting of one long and two short setae.
Genus *Heterolepisma* Esch., 1905. 3
3. Metasternum a simple more or less rounded or triangular plate. 4
Metasternum complicated, consisting of a small anterior plate which tapers posteriorly to a point, and on each side of the taper with an oval plate. Tergite X slightly longer than wide at the base, with tapering sides and squarish apex. Stylets only on sternite IX.
H. hartmeyerii Silv., 1908 5
4. Stylets present only on sternites VIII to IX. 5
Stylets on sternites V-IX, occasionally only on VI-IX or VII-IX. Metasternum with apex slightly concave. Tergite X wider at base than long. *H. stilvarius* Silv., 1903
5. Metasternum as long as wide at base with tapering sides and rounded apex. Tergite X as long as wide at base. 6
H. michaelsoni Silv., 1908
Metasternum wider than long and evenly rounded. Tergite X triangular with rounded apex. *H. kracpelini* Silv., 1903
6. Tergite X long and triangular with sharp apex and laterally with many (at least two) brushes of setae. Prosternum without a brush of setae. 7
Tergite X shorter, trapezoidal or rounded, or a short obtuse triangle, with only one lateral brush of setae. 11
Genus *Acrotelsella* Silv.
7. Sternite IX of male considerably produced. 8
Sternite IX of male not unduly produced. 9
8. Sternite of male produced to twice the length of stylet IX. *A. producta* (Esch., 1905)
Sternite IX of male only produced to length of stylet IX. *A. splendens* (Nicholls and Richardson, 1925) 10
9. Stylets present on sternites VIII-IX. 10
Stylets present only on IX. *A. devriesiana* s.sp. *perspinata* (Silv., 1908)
10. Stylets on sternite VIII of normal length. *A. devriesiana* (Silv., 1908)
Stylets on sternite VIII very much reduced. *A. westralis* (Nicholls and Richardson, 1925)
11. Anterior abdominal tergites (at least II-VI) with four brushes, the following with two. Maxillary palpi 5-segmented. 13
Genus *Ctenolepisma* Esch., 1905 (Tropicopolitan)
Abdominal tergites II-VIII with only two brushes of setae. Maxillary palpi 5- or 6-segmented. *Thermobia* Berg., 1890 12
12. Maxillary palpi 5-segmented. *T. aegyptica* (Luc., 1840)
Maxillary palpi 6-segmented. *T. domestica* (Pack., 1873) (Cosmopolitan)
13. White or cream-coloured species with the outer brushes on tergites II-IV. Stylets on VIII-IX. *C. longicaudata* Esch., 1905
Brownish species with more or less of two longitudinal lighter streaks. Outer brushes on tergites II-VII. Stylets on VII-IX. *C. lineata* var. *pilifera* (Luc., 1840)

Genus *LEPISMA* Gerv.*LEPISMA SACCHARINA* L., 1758.

This is the common house silver-fish of Europe which has been introduced by commerce into Australia. It is to be found in grain and similar factories in the larger towns of the Commonwealth.

Genus *HETEROLEPISMA* Esch, 1905.

An indigenous genus represented by four known species from Australia.

HETEROLEPISMA STILIVARIUS Silv., 1908.

Hitherto known only from the original localities in Western Australia, where it was taken by the Michaelsen Hartmeyer Expedition. I have recently received two specimens, collected from under a log at Mount Lofty, South Australia, May 15, 1937 (J. S. W.). As indicated in the key, the number of stylets is variable.

HETEROLEPISMA MICHAELSENI Silv., 1908.

Described from the Michaelsen Hartmeyer material from Western Australia, this species has also been found under eucalypt bark at Glenunga, South Australia.

HETEROLEPISMA KRAEPELINI Silv., 1908.

Described from Yalgoo, Western Australia. It is a fairly common species in the foothills of the Mount Lofty Ranges at Glen Osmond, South Australia.

HETEROLEPISMA HARTMEYERI Silv., 1908.

This species is only known from the original locality at Northampton, Western Australia, where it was taken by the Michaelsen Hartmeyer Expedition.

Genus *ACROTELSELLA* Silv.

This genus was erected in 1934 by Silvestri for all Eschrich's species of *Acrotelsa* except the genotype, *A. collaris*, which differed from the rest by the presence of a strong brush of setae on the prosternum. Four species and one subspecies are known from Australia.

ACROTELSELLA PRODUCTA (Esch., 1905).

Only known from the original material in the Hamburg Museum from "Peak Downs," North Australia. Two varieties have been described (1934) by Silvestri from the Marquesas.

ACROTELSELLA DEVRIESIANA (Silv., 1908).

This species was described from the Michaelsen Hartmeyer material from many localities in Western Australia. A number of specimens were collected by the writer from under fallen logs at Inneston, Yorke Peninsula, South Australia, in April, 1936.

Subsp. *PERSPINATA* (Silv., 1908).

Described from Denham and Dongarra in Western Australia, this variety differs from the typical form in the absence of stylets on sternite VIII.

ACROTELSELLA SPLENDENS (N. and R., 1925).

This species was described from Mount Nairn and the Milly Milly district of Western Australia. It is very close to *A. producta* but differs in the much shorter prolongations of the ninth sternite. It has also been taken at Marino and Glen Osmond, South Australia.

ACROTELSELLA WESTRALIS (N. and R., 1925).

Only known from a single male from Beaconsfield, Western Australia. It can be distinguished as in the key.

Genus CTENOLEPISMA Esch., 1905.

CTENOLEPISMA LONGICAUDATA Esch., 1905.

This is considered to be a South African species which has become largely tropicopolitan. It is very abundant and widespread in Australia and frequently a serious pest in houses. It is of a whitish cream colour but lacks the silver sheen of *Lepisma saccharina*.

CTENOLEPISMA LINEATA var. PILIFERA (Lucas, 1840).

This is an Egyptian form which has probably been spread by commerce. I have specimens from Melbourne collected by Miss E. Lindsay. The typical form differs from the preceding species morphologically in having the outer brushes present on tergite VII. From the typical form the variety *pilifera* differs in having three pairs of stylets.

Genus THERMOBIA Berg, 1890.

THERMOBIA DOMESTICA (Pack., 1873).

Commonly known as the "fire-brat" of Europe and America, this cosmopolitan insect occurs in Melbourne, and was also recorded as taken by the Michaelsen Hartmeyer Expedition at Day Dawn, Western Australia.

THERMOBIA AEGYPTICA (Luc., 1840).

I have seen specimens of this introduced species collected by Miss Janet Raff in Melbourne.

Subfamily NICOLETINAE Escherich, 1905.

In Australia this subfamily comprises the three genera *Trinemura* Silv., *Atelura* Heyd. and *Atopatelura* Silv. The last two are mainly confined to the nests of ants and termites, and their species are rather small oval insects with comparatively short antennae and tail appendages and are always thickly covered with scales, which give them a somewhat golden colour. The species of *Trinemura* are elongate parallel-sided insects and are not scale covered.

KEY TO THE AUSTRALIAN GENERA AND SPECIES.

1. Body elongate with parallel sides, without scales. Cerci and median tail appendage long. Colour, whitish or creamy white. Stylets present on segments III-IX. Exsertile vesicles on VII, or on III-VII. Genus *Trinemura* Silv., 1908. 2
 - Body broad and oval, rapidly tapering, scaled. Cerci and median tail appendage short. 3
 - Colour, yellowish or golden.
 2. Exsertile vesicles only on segment VII. Second antennal segment in male without apophysis. *T. novae-hollandiae* Silv., 1908
 - Genotype from Western Australia.
- Exsertile vesicles on segments III-VII. Second antennal segment in male with apophysis. *T. excelsa* Silv., 1920. South Australia

3. Stylets present on sternites III-IX, those on III placed close together on medial line. Vesicles present on sternites VI-VII. Genus *Atopatelura* Silv., 1908 4
Stylets present only on V-IX or VI-IX, and always widely separated. Vesicles on sternites VI-VII. Genus *Atelura* Heyd., 1855 6
4. Dorsal setae of abdominal tergites in a submedial transverse row, the setae almost as long as the segments. Antennae 16-segmented. *A. hartmeyeri* Silv., 1903. Western Australia
Dorsal setae not so long and relatively thicker, in a subposterior transverse row on each segment. 5
5. Antennae 17-segmented. *A. kraepelini* Silv., 1908. Western Australia and Victoria
Antennae 20-segmented. *A. michaelsoni* Silv., 1903
6. Four pairs of stylets present, on segments VI-IX. *A. disjuncta* Silv., 1903
Five pairs of stylets present, on segments V-IX. *A. similata* Silv., 1908. Western Australia

Genus ATELURA Heyden, 1855.

The silver-fish belonging to this and the next genus are rather small, somewhat oval insects with a rapidly tapering body. They are eyeless and scaled with hyaline multiradiate scales. The antennae are shorter than the body and many segmented, while the legs, although rather short, are very powerful and enable the creature to run with very great rapidity. The cerci and median tail appendage are comparatively short, the tail being the longest. In the Australian species of *Atelura*, stylets are only present on sternites V-IX or VI-IX, and exsertile vesicles on VI-VII. In *Atopatelura* stylets are found on sternites III-IX, but those on III are placed close together near the middle line. Both genera are to be found associated with ants and termites.

ATELURA DISJUNCTA Silv., 1908.

Atelura disjuncta Silv., 1908. Fauna Südwest Austr., vol. ii, p. 56, pl. vi, figs. 75-87.

Silvestri's material was collected by the Michaelson Hartmeyer Expedition from Guildford and Gooseberry Hill, Western Australia. I have material also from the following localities, all in Western Australia.

Parkerville, July 5, 1930 (H. W.); Perth, October 4, 1930 (H. W.); Perth, February 21, 1931 (with ants) (H. W.); Perth, April, 1931 (H. W.); Mandurah, April 30, 1931 (H. W.); Waroona, May 2, 1931 (H. W.); Red Hill, August 27, 1931 (D. C. S.); Chittering, October 10, 1931 (H. W.).

ATELURA SIMILATA Silv., 1908.

Atelura similata Silv., 1908, Fauna Südwest Austr., vol. ii, p. 55, pl. v, figs. 65-72; pl. vi, figs. 73-74.

Only known from the original material from Boorabbin, Western Australia, collected by the Michaelson Hartmeyer Expedition.

Genus ATOPATELURA Silv., 1908.

Differs from *Atelura* Heyd. as detailed under that genus. The type species *A. furcifera* Silv. is from the Congo. The following three Australian species are known.

ATOPATELURA HARTMEYERI Silv., 1908.

Atopatelura hartmeyeri Silv., 1908, Fauna Südwest Austr., vol. ii, p. 60, pl. viii, figs. 117-127.

In addition to the original locality I have material from the following Western Australian places.

King's Park, Perth, September 28, 1930 (with termites) (H. W.); Red Hill, August 27, 1931 (D. C. S.); Chittering, October 10, 1931 (with ants), (H. W.); Kalamunda, June 1, 1932 (with ants), (G. E. N.).

ATOPATELURA KRAEPELINI Silv., 1908.

Atopatelura kraepelini Silv., 1908, Fauna Südwest Austr., vol. ii, p. 58, pl. vii, figs. 103-108; pl. viii, figs. 109-116.

Originally recorded from the nests of ants at Albany, Western Australia, the writer has also found it in King's Park, Perth, Western Australia, and associated with the ant *Notoncus* sp. at Fern Tree Gully, Victoria, in January, 1937.

ATOPATELURA MICHAELSENI Silv., 1908.

Atopatelura michaelсени Silv., 1908, Fauna Südwest Austr., vol. ii, p. 57, pl. vi, figs. 88-89; pl. vii, figs. 92-102.

As yet only known from the original locality of Gooseberry Hill, Western Australia.

Genus TRINEMURA Silv., 1908.

This genus was erected for a species *T. novae-hollandiae* Silv. from Western Australia. It is very close to the genus *Nicoletia* Gerv., from which the genotype differs in having only a single pair of exsertile vesicles on sternite VII, and stylets on III-IX instead of vesicles on II-VII and stylets on II-IX. *Trinemophora* Schöff. has no vesicles and stylets only on VIII and IX. In 1920 Silvestri described a second species from South Australia under the name of *T. excelsa* which possessed vesicles on sternites III-VII, and the male of which had an apophysis on the second antennal segment. In 1936 the present writer described a species *Nicoletia australis* from South Australia, being at the time unaware of Silvestri's second species of *Trinemura*. My species was placed in *Nicoletia* because of the presence of exsertile vesicles on sternites III-IX. The stylets were given as being on II-IX, but this was in error as they only occur on III-IX. Silvestri appears to regard the number of stylets as of more importance generically than that of the vesicles, and, therefore, while my species is conspecific with his *T. excelsa*, my placing of it in *Nicoletia* does not stand.

A third species, *T. novae-caledoniae*, has also been described by Silvestri from New Caledonia which has exsertile vesicles on sternites II-VII.

TRINEMURA NOVAE-HOLLANDIAE Silv., 1908.

Trinemura novae-hollandiae Silv., 1908, Fauna Südwest Austr., vol. ii, p. 62, pl. ix, figs. 128-141.

Originally described from Gooseberry Hill, Western Australia, the writer found several specimens under a stone in the damp bed of a creek at Armadale on August 21, 1931, and again at Kelmscott on September 4, 1932, while Mr. D. C. Swan took it at Pinjarra on September 30, 1931. It is not known outside of Western Australia.

TRINEMURA EXCELSA Silv., 1920.

Trinemura excelsa Silv., 1920, Boll. Lab. Zool. Portici, vol. xiv, p. 216, figs. 1, 2.

Nicoletia australis Wom., 1936, Trans. Roy. Soc. S. Austr., vol. lx, p. 112, fig. 1 a-g.

The original material, two males only, was collected by Prof. Silvestri in the neighbourhood of Mount Lofty, South Australia, while my own material was found in a rotten log in the National Park, at Belair, South Australia. Recently I collected a single specimen from under a stone on Mount Lofty, May 12, 1937.